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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

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U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5)

UNKNOWN 69/869680

INTERNATIONAL APPLICATION NO.

PCT/JP99/07381

INTERNATIONAL FILING DATE

DECEMBER 27, 1999

PRIORITY DATE CLAIMED

JANUARY 26, 1999

TITLE OF INVENTION

LINEAR LIGHT SOURCE AND IMAGE READING APPARATUS INCORPORATING THE SAME

APPLICANT(S) FOR DO/EO/US

FUJIMOTO, HISAYOSHI; ONISHI, HIROAKI; IMAMURA, NORIHIRO

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(l).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98, Form 1449, 7 References.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: PCT/ISA/210, PCT/IB/304, PCT/IB/308, PCT/IPEA/409, Certification of Translation

U.S. APPLICATION NO (If known, see 37 CFR 1.5) UNKNOWN 09/ 869680	INTERNATIONAL APPLICATION NO PCT/JP99/07381	ATTORNEY'S DOCKET NUMBER 10921.96USWO
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17. [X] The following fees are submitted:				CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492(a) (1)-(5)): Search Report has been prepared by the EPO or JPO.....\$860.00 International preliminary examination fee paid to USPTO (37 CFR 1.492(a)(1)).....\$690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....\$710.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(3)) paid to USPTO \$1000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)\$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$860.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$0	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	17 -20 = 0		X \$18.00	\$0	
Independent claims	4 -3 = 1		X \$80.00	\$80.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$260.00	\$0	
TOTAL OF ABOVE CALCULATIONS =				\$940.00	
Reduction by 1/2 for filing by small entity, if applicable. Small entity status is claimed pursuant to 37 CFR 1.27				\$0	
SUBTOTAL =				\$940.00	
Processing fee of \$130.00 for furnishing the English translation later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+	\$0
TOTAL NATIONAL FEE =				\$940.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+	\$40.00
TOTAL FEES ENCLOSED =				\$980.00	
				Amount to be:	
				refunded	\$0
				charged	\$0

- a. [X] Check(s) in the amount of \$940.00 and \$40.00 to cover the above fees is enclosed.
- b. [] Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.
- c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 13-2725.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO
 Douglas P. Mueller
 MERCHANT & GOULD
 P.O. Box 2903
 Minneapolis, MN 55402-0903

SIGNATURE: 

NAME: Douglas P. Mueller

REGISTRATION NUMBER: 30,300

S/N unknown

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JC18 Rec'd PCT/PTO 03 JUL 2001
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Fujimoto, et al. Docket No.: 10921.96USWO
Serial No.: unknown Filed: concurrent herewith
Int'l Appln No.: PCT/JP99/07381 Int'l Filing Date: December 27, 1999
Title: LINEAR LIGHT SOURCE AND IMAGE READING APPARATUS
INCORPORATING THE SAME

CERTIFICATE UNDER 37 CFR 1.10

'Express Mail' mailing label number: EL658338473US

Date of Deposit: July 3, 2001

I hereby certify that this paper or fee is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 and is addressed to the Commissioner for Patents, Washington, D C. 20231.

By:

Name: Omesh Singh

BRANT NITLES

PRELIMINARY AMENDMENT

Box PCT
Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment, a copy of which is enclosed herewith:

IN THE ABSTRACT

Insert the attached Abstract page into the application as the last page thereof.

IN THE SPECIFICATION

A courtesy copy of the present specification is enclosed herewith. However, the World Intellectual Property Office (WIPO) copy should be relied upon if it is already in the U.S. Patent Office.

REMARKS

A new abstract page is supplied to conform to that appearing on the publication page of the WIPO application, but the new Abstract is typed on a separate page as required by U.S. practice.

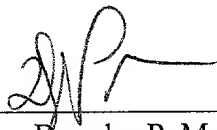
Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, Douglas P. Mueller (Reg. No. 30,300), at (612) 371.5237.

Respectfully submitted,

MERCHANT & GOULD P.C.
Post Office Box 2903
Minneapolis, Minnesota 55402-0903
(612) 332-5300

Dated: July 3, 2001

By 
Douglas P. Mueller
Reg. No. 30,300

DPM/rw



ABSTRACT
PCT/JP99/07381

**LINEAR LIGHT SOURCE AND IMAGE READING APPARATUS
INCORPORATING THE SAME**

A linear light source (A) including an insulating substrate (1), a plurality of light emitting elements (3) arranged in columns on the substrate (1), a wiring pattern (2) connected with the light emitting elements (3) and formed on the substrate (1) so as to divide the light emitting elements (3) into a plurality of groups (B_1 to B_n), and first and second terminal units (23a, 23b) in continuity with the wiring pattern (2). The plurality of light emitting elements (3) define a plurality of clearances (P_1 to P_{2n-1}) between adjacent light emitting elements, the clearances (P_1 to P_{2n-1}) being adjusted so as to have different lengths.

CERTIFICATE UNDER 37 CFR 1.10

'Express Mail' mailing label number: EL658338473US

Date of Deposit: July 3, 2001

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By: 

Name: Omesh Singh

BRANT MILLER

7/PR15

09/869680

JC18 Rec'd PCT/PTO 03 JUL 2001

SPECIFICATION

LINEAR LIGHT SOURCE AND IMAGE READING APPARATUS

INCORPORATING THE SAME

5

TECHNICAL FIELD

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The present invention relates to a linear light source used for irradiating a linear region with light. It also relates to an image reading apparatus incorporating such a linear light source.

BACKGROUND ART

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Conventionally, various linear light sources are used in image reading apparatus. Fig. 7A illustrates an example of prior-art linear light source. The light source includes an insulating rectangular substrate 90 and a plurality of LEDs (light emitting diodes) 92. The substrate 90 has a surface formed with a wiring pattern 8 (darkened portion). The LEDs 92 are arranged at a predetermined pitch in a row extending longitudinally of the substrate 90.

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The wiring pattern 8 includes two wiring portions extending longitudinally of the substrate 92, i.e., a first wiring portion 80 and a second wiring portion 81. The first wiring portion 80 has one end connected to a first terminal 83a, whereas the second wiring portion 81 has one end connected to a second terminal 83b. The above-described row of LEDs 92 is arranged between the first wiring portion 80 and the

second wiring portion 81. The wiring pattern 8 further includes a plurality of auxiliary wiring portions 82 which are also arranged between the first wiring portion 80 and the second wiring portion 81.

5 As shown in Fig. 7A, each auxiliary wiring portion 82 has a left end at which is disposed one LED 92, which is connected to the first wiring portion 80 via a wire W. Other LEDs 92 are disposed at predetermined portions of the second wiring portion 81. Each of these LEDs 92 is connected via
10 a wire W to the right end of the corresponding auxiliary wiring portion 82.

Fig. 7B is a circuit diagram of the above-described linear light source. As will be understood from this figure, the plurality of LEDs 92 are divided into a plurality of groups
15 $b_1 \sim b_n$ (each group including two LEDs 92 connected in series). These groups $b_1 \sim b_n$ are connected in parallel to each other with respect to the first and the second wiring portions 80, 81. With this structure, when a predetermined voltage is applied across the first and the second terminals 83a, 83b, the
20 plurality of LEDs 92 emit light.

Although the above-described prior art linear light source can be used in various types of image reading apparatus, it has the following problems. Although the wiring pattern 8 conducts a current well, the electrical resistance is not
25 zero. Therefore, in the prior art structure shown in Fig. 7A, due to this inherent electrical resistance, the luminosity of light emitted from the LEDs 92 which belong to

one group (e.g., group b_1) does not equal to the luminosity of light emitted from LEDs 92 which belong to another group (e.g., group b_3).

In more detail with reference to Fig. 7B, since the wiring pattern 8 itself has an electrical resistance, the first wiring portion 80 has a resistance R_v between adjacent groups (b_i and b_{i+1}), whereas the second wiring portion 81 has a resistance R_g between adjacent groups (b_i and b_{i+1}). Therefore, a voltage applied to the LEDs in a group located farther from the first and the second terminals 83a, 83b becomes smaller than the voltage applied to the LEDs in a group located closer to the terminals. As a result, LEDs in each group emit a different amount of light from each other. Specifically, the LEDs 92 which belong to the group b_1 emit the brightest light whereas the LEDs 92 in the group b_n emits the weakest light. Light emitted from the LEDs becomes gradually weaker from the group b_2 to the group b_{n-1} .

With the prior art linear light source having the above-described characteristics, it is impossible to uniformly illuminate a document to be read with light, so that an appropriately read image may not be obtained. Such a problem occurs notably when an image reading apparatus is driven at a low voltage (for example, 5V).

DISCLOSURE OF THE INVENTION

An object of the present invention, which is proposed to solve or alleviate the above-described problem, is to

provide a linear light source which is capable of uniformly illuminating a linear region with light. Another object of the present invention is to provide an image reading apparatus incorporating such a linear light source.

5 In accordance with a first aspect of the present invention, there is provided a linear light source comprising: an insulating substrate; a plurality of light emitting elements arranged in a row on the substrate, a wiring pattern formed on the substrate in electrical connection with
10 the plurality of light emitting elements for dividing the plurality of light emitting elements into a plurality of groups; and a first and a second terminals in conduction with the wiring pattern; wherein the plurality of light emitting elements define a plurality of intervals between adjacent
15 light emitting elements; one of the plurality of intervals being different in length from another of the intervals.

With such a structure, by adjusting the intervals defined between the light emitting elements, it is possible to uniformly illuminate the linear region of the document even
20 if the luminosity of light emitted from the light emitting elements is not uniform.

In a preferred embodiment of the present invention, the interval between weaker light emitting elements is shorter than the interval between brighter light emitting
25 elements.

Preferably, the wiring pattern forms a plurality of current paths which correspond to the plurality of groups and

extend from the first terminal to the second terminal. The interval defined between the light emitting elements of a group corresponding to a shorter one of the current paths is narrower than the interval defined between the light emitting
5 elements of another group corresponding to a longer one of the current paths.

Preferably, each of the plurality of groups includes at least two light emitting elements. Of course, each group may include three or more light emitting elements.

10 According to a preferred embodiment, the substrate includes a first end and a second end opposite thereto, and the row of light emitting elements extends in a direction from the first end toward the second end, the plurality of intervals becoming gradually narrower in said direction.

15 According to another preferred embodiment, the substrate includes a first end, a second end opposite thereto, and an intermediate portion located between the first end and the second end, the row of light emitting elements extending from the first end to the second end, the plurality of
20 intervals becoming gradually narrower from the intermediate portion toward the first end and the second end.

The first terminal and the second terminal may be disposed at the intermediate portion of the substrate.

25 Preferably, the wiring pattern includes a first and a second wiring portions extending longitudinally of the substrate, the plurality of light emitting elements being arranged between the first wiring portion and the second

wiring portion.

Preferably, the linear light source may further comprise a plurality of photo-electric converters mounted on the substrate.

5 According to a second aspect of the present invention, there is provided an image reading apparatus comprising: a case; a transparent plate supported by the case; an image forming lens supported by the case; and a linear light source for illuminating a document to be read, the linear light source
10 including an insulating substrate, a plurality of light emitting elements arranged in a row on the substrate, a wiring pattern formed on the substrate in electrical connection with the plurality of light emitting elements for dividing the light emitting elements into a plurality of groups, and a first
15 and a second terminals in conduction with the wiring pattern; wherein the plurality of light emitting elements define a plurality of intervals between adjacent light emitting elements, one of the plurality of intervals being different in length from another of the intervals.

20 According to a third aspect of the present invention, there is provided a linear light source comprising: an insulating substrate having a first end and a second end opposite thereto; a plurality of light emitting elements supported on the substrate and arranged in a row extending
25 from the first end to the second end; a wiring pattern in electrical connection with the plurality of light emitting elements, the wiring pattern including a first and a second

wiring portions extending from the first end to the second end of the substrate; and a first and a second terminals formed on the substrate; wherein the first wiring portion includes a connecting end located close to the first end of the substrate, the second wiring portion including a connecting end located close to the second end of the substrate, the connecting end of the first wiring portion being connected to the first terminal, the connecting end of the second wiring portion being connected to the second terminal, whereby the plurality of light emitting elements emit light of substantially equal brightness.

Preferably, the plurality of light emitting elements are arranged between the first wiring portion and the second wiring portion and divided into a plurality of groups by the wiring pattern.

In a preferred embodiment, the first and the second terminals are arranged closer to the second end than to the first end of the substrate.

In another preferred embodiment, the substrate includes an intermediate portion located between the first end and the second end of the substrate, the first terminal and the second terminal being disposed at the intermediate portion.

Preferably, the plurality of light emitting elements are arranged on the substrate at substantially equal intervals.

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According to a fourth aspect of the present invention,
there is provided an image reading apparatus comprising: a
case; a transparent plate supported by the case; an image
forming lens supported by the case; and a linear light source
5 for illuminating a document to be read, the linear light source
including an insulating substrate having a first end and a
second end opposite thereto, a plurality of light emitting
elements supported on the substrate and arranged in a row
extending from the first end to the second end, a wiring
10 pattern in electrical connection with the plurality of light
emitting elements, the wiring pattern including a first and
a second wiring portions extending from the first end to the
second end of the substrate, and a first and a second terminals
formed on the substrate; wherein the first wiring portion
15 includes a connecting end located close to the first end of
the substrate, the second wiring portion including a
connecting end located close to the second end of the substrate,
the connecting end of the first wiring portion being connected
to the first terminal, the connecting end of the second wiring
20 portion being connected to the second terminal so that the
plurality of light emitting elements emit light of
substantially equal brightness.

Other features and advantages of the present invention
will become clearer from the detailed description of
25 preferred embodiments given below with reference to the
accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A is a plan view showing a linear light source in accordance with a first embodiment of the present invention, and Fig. 1B is a circuit diagram of the same linear light source.

Fig. 2 is a sectional view showing an image reading apparatus incorporating the linear light source of Fig. 1A.

Fig. 3 is a circuit diagram of a linear light source in accordance with a second embodiment of the present invention.

Fig. 4A is a plan view showing a linear light source in accordance with a third embodiment of the present invention, and Fig. 4B is a circuit diagram of the same linear light source.

Fig. 5A is a plan view showing a linear light source in accordance with a fourth embodiment of the present invention, and Fig. 5B is a circuit diagram of the same linear light source.

Fig. 6A is a plan view showing a linear light source in accordance with a fifth embodiment of the present invention, and Fig. 6B is a circuit diagram of the same linear light source.

Fig. 7A is a plan view showing a conventional linear light source, and Fig. 7B is a circuit diagram of the same linear light source.

BEST MODE FOR CARRYING OUT THE INVENTION

Preferred embodiments of the present invention will be described below with reference to Figs. 1A~6B. Throughout these figures, the elements which are identical or similar
5 are designated by the same reference signs.

A reference is first made to Figs. 1A and 1B. Fig. 1A is a plan view showing a linear light source A in accordance with a first embodiment of the present invention. Fig. 1B is a circuit diagram of the light source A. As shown in Fig.
10 1A, the light source A includes a rectangular insulating substrate 1, a wiring pattern 2 (darkened portion) provided on a surface of the substrate 1, a plurality of LEDs 3 mounted on the wiring pattern 2, and a plurality of photo-electric converters 4. The substrate 1 may be made of a ceramic
15 material or a glass-fiber-reinforced epoxy resin. The plurality of LEDs 3 are arranged in a row extending longitudinally of the substrate 1.

The wiring pattern 2 may be formed by etching a metal film (e.g., a copper foil) applied on the substrate 1 by vapor
20 deposition or sputtering. The basic structure of the wiring pattern 2 is similar to the wiring pattern (Fig. 7A) of the prior art described before. Specifically, the wiring pattern 2 includes two wiring portions extending longitudinally of the substrate 1, i.e., a first wiring
25 portion 21 and a second wiring portion 22. The first wiring portion 21 has one end connected to a first terminal 23a, whereas the second wiring portion 22 has one end connected

to a second terminal 23b. The row of LEDs 3 is arranged between the first wiring portion 21 and the second wiring portion 22.

The wiring pattern 2 further includes a plurality of auxiliary wiring portions 24, and wirings (not shown) for connecting the photo-electric converters 4 to additional terminals 23c. The auxiliary wiring portions 24 are arranged between the first wiring portion 21 and the second wiring portion 22.

As shown in Fig. 1A, each of selected ones of the plural LEDs 3 is mounted on a left end of a respective auxiliary wiring portion 24 and connected to the first wiring portion 21 via a wire W. The remaining LEDs 3 are mounted at suitable positions of the second wiring portion 22, and each of these remaining LEDs 3 is connected to the right end of a respective auxiliary wiring portion 24 via a wire W.

The first and the second terminals 23a, 23b are provided close to each other at one longitudinal end 1a of the substrate 1. The terminals 23a, 23b and the additional terminal 23c are connected to a suitable connector (not shown). Electric power for driving the LEDs 3 is supplied from outside through the connector.

The first wiring portion 21 is formed, at one end thereof (right end in Fig. 1A), with a first short extension 25a connected to the first terminal 23a. Similarly, the second wiring portion 22 is formed, at the right end thereof, with a second extension 25b connected to the second terminal

23b.

Each of the photo-electric converters 4 comprises an elongated IC chip having an obverse surface provided with a plurality of light receiving elements 40. The light receiving elements 40 are arranged at equal intervals longitudinally of the IC chip. Each of the light receiving element 40 outputs electric signals (image signals) corresponding to the received amount of light. As shown in Fig. 1A, the photo-electric converters 4 are spaced from the LEDs 3 and the wiring pattern 2 and arranged in a row extending in the same direction as the row of LEDs 3.

As shown in Fig. 1B, the plurality of LEDs 3 are divided into a plurality of groups $B_1 \sim B_n$ (each group including two LEDs 3 connected in series). These groups $B_1 \sim B_n$ are connected in parallel to each other with respect to the first and the second wiring portions 21, 22. With this structure, when a predetermined voltage is applied across the first and the second terminals 23a, 23b, the plurality of LEDs 3 emit light. More specifically, the second terminal 23b is grounded, and a voltage of e.g., 5V is applied to the first terminal 23a.

Similarly to the prior art structure, since the wiring pattern 2 itself has an electrical resistance, the first wiring portion 21 has a resistance R_v between adjacent groups (B_i and B_{i+1}), whereas the second wiring portion 22 has a resistance R_g between adjacent groups (B_i and B_{i+1}). Therefore, the voltage applied to the LEDs 3 in a group located farther from the first and the second terminals 23a, 23b (i.e., having

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a longer current path) becomes smaller than the voltage applied to the LEDs in a group located closer to the terminals (i.e., having a shorter current path). As a result, the LEDs 3 belonging to the group B_1 emit the brightest light, whereas the LEDs 3 belonging to the group B_n emits the weakest light. Light emitted from the LEDs 3 becomes gradually weaker from the group B_2 to the group B_{n-1} .

The light source A of the present invention is characterized in that the plurality of LEDs 3 are arranged at different intervals. Specifically, when the number of groups of LEDs 3 is n , the total number of intervals (P) defined between the LEDs 3 is $2n-1$. As shown in Fig. 1A, the intervals are identified as $P_1, P_2, \dots, P_{2n-1}$, respectively, from the right end toward the left end of the substrate 1. In the first embodiment of the present invention, the intervals $P_1, P_2, \dots, P_{2n-1}$ are so set as to satisfy the relation $P_1 > P_2 > \dots > P_{2n-1}$.

With such an arrangement, a weaker (or darker) LED 3 is located close to another LED 3 for equalizing luminance over the entire row of LEDs. Therefore, with the light source A of the present invention, it is possible to uniformly illuminate a linear region of a document to be read.

Next, reference is made to Fig. 2. This figure is a sectional view showing an image reading apparatus S incorporating the above-described linear light source A. The image reading apparatus S includes a case 50 formed of a synthetic resin, a transparent plate 51 mounted at an upper surface portion of the case 50, and an image-forming lens 52

mounted in the case 50 in facing relationship to the reverse surface of the transparent plate 51. The substrate 1 of the above-described linear light source A is mounted at a bottom surface portion of the case 50. The case 50 includes a light path 50a defined therein. Light emitted from LEDs 3 of the light source A is guided along the light path 50a to reach an image read line L defined on an obverse surface of the transparent plate 51. Then, the light is reflected on a document D disposed on the transparent plate 51 and passes through the image-forming lens 52 to be collected. The collected light is received by the photo-electric converters 4 of the light source A. The photo-electric converters 4 are located directly below the image-forming lens 52.

Though not illustrated, the transparent plate 51 is upwardly provided with a platen roller for transferring the document D in a secondary scanning direction (which is perpendicular to the image read line L). By intermittently transferring the document D in the secondary scanning direction by the platen roller, an image of the document D is read line by line. However, when the image reading apparatus S is utilized as a hand scanner, the platen roller is not necessary. In such a case, the image reading apparatus S itself is moved in the secondary scanning direction for reading an image of the document D.

Fig. 3 schematically illustrates principal portions of a linear light source Aa in accordance with a second embodiment of the present invention. In this and the

subsequent embodiments, description is omitted with respect to the items which are identical or similar to those already described in the first embodiment.

The illustrated light source Aa includes a rectangular substrate 1 formed with a wiring pattern 2A. At the longitudinally central portion of the substrate 1, a first terminal 23a and a nearby second terminal 23b are provided. The wiring pattern 2A includes a first and a second wiring portions 21, 22 extending longitudinally of the substrate 1, and a plurality of auxiliary wiring portions 24 arranged therebetween.

The first wiring portion 21 is connected via a first extension 25c provided at a longitudinally central portion of the substrate 1 to the first terminal 23a. The second wiring portion 22 is connected via a second extension 25d to the second terminal 23b. The second extension 25d is insulated from the first wiring portion 21 by utilizing a non-illustrated jumper or through-hole.

The plurality of LEDs 3 are divided by the first and the second extensions 25c, 25d into a right and a left groups. Each of these groups is further divided into smaller groups or subgroups ($B_{R1} \sim B_{Rn}$ and $B_{L1} \sim B_{Ln}$). Each of the subgroups includes two LEDs 3 connected in series to each other. The subgroups of LEDs 3 are connected in parallel to each other with respect to the first and the second wiring portions 22.

Similarly to the first embodiment, the luminosity of light emitted from the LEDs 3 of the light source Aa varies

from one subgroup to another due to the electrical resistances R_v , R_g inherent to the first and the second wiring portion 22. Specifically, the LEDs 3 belonging to the subgroup B_{R1} emit the brightest light, but the light from the LEDs become weaker as the location of the subgroups becomes closer to the right end of the substrate 1. Thus, the LEDs 3 belonging to the subgroup B_{Rn} emit the weakest light. This fact holds for the LEDs 3 belonging to the left side subgroups $B_{L1} \sim B_{Ln}$. It is to be noted that the LEDs belonging to mutually corresponding right and left subgroups (e.g., the subgroup B_{R1} vs the subgroup B_{L1} , and the subgroup B_{R2} vs the subgroup B_{L2}) emit light of the same luminosity.

As shown in Fig. 3, the two LEDs 3 in the subgroup B_{R1} are spaced from each other by an interval P_2 , whereas the two LEDs 3 in the subgroup B_{R2} are spaced from each other by an interval P_4 . (Generally, two LEDs 3 in the subgroup B_{Rn} are spaced from each other by an interval P_{2n} .) This holds for the subgroups $B_{L1} \sim B_{Ln}$. The subgroup B_{R1} and the subgroup B_{L1} are spaced from each other by an interval P_1 .

In the second embodiment of the present invention, the intervals P_1 , P_2 , P_3 , ..., P_{2n} are so set as to satisfy the relation $P_1 > P_2 > P_3 > \dots > P_{2n}$. With such an arrangement, similarly to the first embodiment, a weaker LED 3 is located close to another LED 3 so that the luminosity of light can be equalized over the entire row of LEDs 3.

In the above-described embodiment, the intervals P between adjacent LEDs 3 are set so that $P_1 > P_2 > P_3 > \dots > P_{2n}$.

However, the present invention is not limited thereto, and some of these intervals P may be equal to each other (e.g., $P_2=P_3$). Further, each subgroup may include not less than three LEDs. Moreover, the number of LEDs included in one
5 subgroup may not be equal to the number of LEDs included in another subgroup.

Next, reference is made to Figs. 4A and 4B. Fig. 4A is a plan view showing a linear light source Ab in accordance with a third embodiment of the present invention. Fig. 4B
10 is a circuit diagram of the light source Ab.

The light source Ab has a basically same structure as that of the light source A shown in Fig. 1A except its characteristic portions. Specifically, the light source Ab includes a rectangular insulating substrate 1, a wiring
15 pattern 2 (darkened portion) formed on the substrate 1, a plurality of LEDs mounted on the wiring pattern 2, and a plurality of photo-electric converters 4.

The wiring pattern 2 includes a first wiring portion 21, a second wiring portion 22 and a plurality of auxiliary
20 wiring portions 24. As shown in Fig. 4A, each of the first wiring portion 21 and the second wiring portion 22 has a generally linear configuration extending longitudinally of the substrate 1. The first wiring portion 21 has a first end 21a (left end in Fig. 4A) and a second end 21b (right end)
25 longitudinally spaced from each other. The second wiring portion 22 has a first end 22a (left end) and a second end 22b (right end) longitudinally spaced from each other. A

plurality of auxiliary wiring portions 24 are arranged between the first wiring portion 21 and the second wiring portion 22.

The first end 21a of the first wiring portion 21 is connected, via a first extension 21A, to a first terminal 23a provided adjacent the right end of the substrate 1. For enabling this structure, the first extension 21A is elongated in parallel to the first wiring portion 21. The second end 22b of the second wiring portion 22 is connected, via the second extension 22A, to a second terminal 23b provided adjacent the first terminal 23a. Adjacent the second terminal 23b (right side in Fig. 4A), a plurality of additional terminals 23c are provided. The additional terminals 23c are connected via a predetermined wiring pattern (not shown) to the photo-electric converters 4.

The auxiliary wiring portions 24 are utilized for dividing the plurality of LEDs 3 into a plurality of groups $B_1 \sim B_n$ and for connecting these groups in parallel to each other with respect to the first and the second wiring portions 21, 22. Specifically, each LED 3 is bonded to one end (left end) of the corresponding auxiliary wiring portion 24 or to a predetermined portion of the second wiring portion 22. As shown in Fig. 4A, each of the LEDs 3 on the second wiring portion 22 is located close to the right end of the corresponding auxiliary wiring portion 24. Each of the LEDs 3 bonded to the left end of the corresponding auxiliary wiring portion is connected, via a wire W, to the first wiring portion

21. On the other hand, each of the LEDs 3 bonded to the second wiring portion 22 is connected, via a wire W, to the right end of the corresponding auxiliary wiring portion 24. Thus, the plurality of LEDs 3 are divided into a plurality of groups $B_1 \sim B_n$ each including two LEDs 3 connected in series. The groups $B_1 \sim B_n$ are arranged in the mentioned order from left to right on the substrate 1. Thus, the group B_1 is located adjacent the left end 21a of the first wiring portion 21, whereas the group B_n is located adjacent the right end 21b of the first wiring portion 21. In this embodiment, the plurality of LEDs 3 are arranged at substantially equal intervals.

The feature of the light source Ab in accordance with the third embodiment of the present invention lies in that the left end 21a of the first wiring portion 21 and the first terminal 23a located at the right end of the substrate 1 are connected via the elongated first extension 21A. This structure brings about the advantages described in the following.

As shown in Fig. 4B, the first wiring portion 21 inherently has divided electrical resistances designated respectively as $R_{v1} \sim R_{vn-1}$. The second wiring portion 22 inherently has divided electric resistances designated respectively as $R_{g1} \sim R_{gn-1}$. Under this condition, consider how each group of LEDs 3 is affected by the resistances between the first end 21a of the first wiring portion 21 and the second end 22b of the second wiring portion 22. As is clear from

Fig. 4B, the two LEDs 3 which belong to the group B_1 are connected in series to an $(n-1)$ number of resistors $R_{G1} \sim R_{G-1}$ in the second wiring portion 22. On the other hand, the two LEDs 3 which belong to the group B_2 are connected in series to the resistor R_{V1} in the first wiring portion 21 and an $(n-2)$ number of resistors $R_{G2} \sim R_{GN-1}$ in the second wiring portion 22.

Thus, the group B_1 and the group B_2 are commonly connected to the resistors $R_{G2} \sim R_{GN-1}$ of the second wiring portion 22. The difference between these groups lies in that, in addition to these resistors, the group B_1 is connected to the resistor R_{G1} of the second wiring portion 22, whereas the group B_2 is connected to the resistor R_{V1} of the first wiring portion 21. In any case, the group B_1 and the group B_2 are connected to the same number $(n-1)$ of resistors. Therefore, by appropriately adjusting the resistance, it is possible to substantially equalize the voltage applied to the LEDs 3 in the group B_1 and the voltage applied to the LEDs 3 in the group B_2 . As a result, it is possible to substantially equalize the luminosity of light emitted from the LEDs 3 in the group B_1 and the luminosity of light emitted from the LEDs 3 in the group B_2 .

Similarly, the LEDs 3 in the group B_i ($3 \leq i \leq n-1$) are connected in series to the resistors $R_{V1} \sim R_{V_{i-1}}$ of the first wiring portion 21 and the resistors $R_{G1} \sim R_{G_{n-1}}$ of the second wiring portion 22. The LEDs 3 which belong to the group B_n are connected in series to the resistors $R_{V1} \sim R_{V_{n-1}}$ in the first wiring portion 21. In any case, the two LEDs in each group

are connected to an (n-1) number of resistors. Therefore,
by appropriately adjusting the resistance, it is possible to
substantially equalize the luminosity of light emitted from
the LEDs 3 in the group B_j ($3 \leq j \leq n$) and the luminosity of light
5 emitted from the LEDs 3 in the group B₁ or B₂.

The first extension 21A and the second extension 22A
also inherently have an electrical resistance. Therefore,
when a current flows through the extensions 21A and 22A, a
voltage drop occurs at each extension in accordance with the
10 resistance. However, since the voltage drop is common to the
LEDs 3 in the groups B₁~B_n, it does not adversely affect the
uniformity of light luminosity of the LEDs 3.

Next, a reference is made to 5A and 5B. Fig. 5A is
a plan view showing a linear light source Ac in accordance
15 with a fourth embodiment of the present invention. Fig. 5B
is a circuit diagram of the light source Ac.

As shown in Fig. 5A, a wiring pattern 2A formed on a
rectangular substrate 1 includes a first wiring portion 26
connected to a first terminal 23a, and a second wiring portion
20 27 connected to a second terminal 23b. As shown in Fig. 5B,
the first terminal 23a is grounded. A predetermined voltage
is applied to the second terminal 23b.

The first wiring portion 26, which is elongated
longitudinally of the substrate 1, includes a left end 26a
25 and a right end 26b. As shown in Fig. 5A, the left end 26a
is located far from the first and the second terminals 23a,
23b, whereas the right end 26b is located close to these

terminals. The left end 26a is connected to a first extension 26A. The first extension 26A is elongated longitudinally of the substrate 1 for connecting the left end 26a of the first wiring portion 26 to the first terminal 23a. The second wiring portion 27, which is also elongated in parallel with the first wiring portion 26, includes a left end 27a and a right end 27b. The right end 27b located closer to the terminals 23a, 23b than the left end 27a is connected, via a second extension 27A having a short length, to the second terminal 23b. Between the left end 26a of the first wiring portion 26 and the right end 27b of the second wiring portion 27, the first wiring portion 26 inherently has divided electrical resistances $R_{G1} \sim R_{Gn-1}$ whereas the second wiring portion 27 inherently has divided resistances $R_{V1} \sim R_{Vn-1}$.

As is clear from Fig. 5B which shows the main circuit of the light source Ac, the LEDs 3 are divided into a plurality of groups $B_1 \sim B_n$ (each including two LEDs 3) also in this embodiment. Similarly to the above-described third embodiment, the LEDs 3 which belong to each group B_i ($1 \leq i \leq n$) are connected in series to an (n-1) number of resistors. Therefore, by appropriately adjusting each resistance, it is possible to substantially equalize the luminosity of light emitted from each group $B_1 \sim B_n$ of LEDs 3.

Next, reference is made to Fig. 6A and 6B. Fig. 6A is a plan view showing a linear light source Ad in accordance with a fifth embodiment of the present invention. Fig. 6B is a circuit diagram of the light source Ad.

The light source Ad includes a rectangular substrate 1, a wiring pattern 2B formed on the substrate 1, a plurality of LEDs 3 mounted on the wiring pattern 2B, and a plurality of photo-electric converters 4 arranged in a row extending longitudinally of the substrate 1. As shown in Fig. 6A, at the longitudinally central portion of the substrate 1, a first terminal 23a and a second terminal 23b are provided. The first terminal 23a is connected to a first extension 28A extending toward the left end of the substrate 1. On the other hand, the second terminal 23b is connected to a second extension 29A extending toward the right end of the substrate 1. The left end of the first extension 28A is connected to a left end 28a of the first wiring portion 28, whereas the right end of the second extension 29A is connected to a right end 29b of the second wiring portion 29.

As shown in Fig. 6B, also in this embodiment, the LEDs 3 are divided into a plurality of groups $B_1 \sim B_n$, and the LEDs 3 which belong to each group B_i ($1 \leq i \leq n$) are connected in series to the same number of resistors. Therefore, by appropriately adjusting each resistance, it is possible to substantially equalize the luminosity of light emitted from each group $B_1 \sim B_n$ of the LEDs 3.

Although LEDs are used in the above-described embodiments, another kind of device may be used for light emitting elements. Further, the number of light emitting elements and the number of groups may be modified. Moreover, the linear light source in accordance with the present

invention may be appropriately used not only for an image reading apparatus but also for other apparatus.

TOP SECRET

CLAIMS

1. A linear light source comprising:

an insulating substrate;

5 a plurality of light emitting elements arranged in a row on the substrate;

a wiring pattern formed on the substrate in electrical connection with the plurality of light emitting elements for dividing the plurality of light emitting elements into a plurality of groups; and

a first and a second terminals in conduction with the wiring pattern;

15 wherein the plurality of light emitting elements define a plurality of intervals between adjacent light emitting elements, one of the plurality of intervals being different in length from another of the intervals.

2. The linear light source according to claim 1, wherein the interval between weaker light emitting elements is shorter than the interval between brighter light emitting elements.

3. The linear light source according to claim 1, wherein the wiring pattern forms a plurality of current paths which correspond to the plurality of groups and extend from the first terminal to the second terminal, and wherein the interval defined between the light emitting elements of a group corresponding to a shorter one of the current paths is narrower

than the interval defined between the light emitting elements of another group corresponding to a longer one of the current paths.

5 4. The linear light source according to claim 1, wherein each of the plurality of groups includes at least two light emitting elements.

10 5. The linear light source according to claim 1, wherein the substrate includes a first end and a second end opposite thereto, the row of light emitting elements extending in a direction from the first end toward the second end, the plurality of intervals becoming gradually narrower in said direction.

15 6. The linear light source according to claim 1, wherein the substrate includes a first end, a second end opposite thereto, and an intermediate portion located between the first end and the second end, the row of light emitting elements extending
20 from the first end to the second end, the plurality of intervals becoming gradually narrower from the intermediate portion toward the first end and the second end.

25 7. The linear light source according to claim 6, wherein the first terminal and the second terminal are disposed at the intermediate portion of the substrate.

8. The linear light source according to claim 1, wherein the wiring pattern includes a first and a second wiring portions extending longitudinally of the substrate, the plurality of light emitting elements being arranged between the first wiring portion and the second wiring portion.

9. The linear light source according to claim 1, further comprising a plurality of photo-electric converters mounted on the substrate.

10. An image reading apparatus comprising:

a case;

a transparent plate supported by the case;

an image forming lens supported by the case; and

a linear light source for illuminating a document to be read, the linear light source including an insulating substrate, a plurality of light emitting elements arranged in a row on the substrate, a wiring pattern formed on the substrate in electrical connection with the plurality of light emitting elements for dividing the light emitting elements into a plurality of groups, and a first and a second terminals in conduction with the wiring pattern;

wherein the plurality of light emitting elements define a plurality of intervals between adjacent light emitting elements, one of the plurality of intervals being different in length from another of the intervals.

11. A linear light source comprising:

an insulating substrate having a first end and a second end opposite thereto;

5 a plurality of light emitting elements supported on the substrate and arranged in a row extending from the first end to the second end;

10 a wiring pattern in electrical connection with the plurality of light emitting elements, the wiring pattern including a first and a second wiring portions extending from the first end to the second end of the substrate; and

a first and a second terminals formed on the substrate;

15 wherein the first wiring portion includes a connecting end located close to the first end of the substrate, the second wiring portion including a connecting end located close to the second end of the substrate, the connecting end of the first wiring portion being connected to the first terminal, the connecting end of the second wiring portion being connected to the second terminal, whereby the plurality of light emitting elements emit light of substantially equal
20 brightness.

12. The linear light source according to claim 11, wherein the plurality of light emitting elements are arranged between the first wiring portion and the second wiring portion and
25 divided into a plurality of groups by the wiring pattern.

13. The linear light source according to claim 11, wherein the first and the second terminals are arranged closer to the second end than to the first end of the substrate.

5 14. The linear light source according to claim 11, wherein the substrate includes an intermediate portion located between the first end and the second end of the substrate, the first terminal and the second terminal being disposed at the intermediate portion.

10

15. The linear light source according to claim 11, wherein the plurality of light emitting elements are arranged on the substrate at substantially equal intervals.

15

16. The linear light source according to claim 11, further comprising a plurality of photo-electric converters mounted on the substrate.

17. An image reading apparatus comprising:

20

a case;

a transparent plate supported by the case;

an image forming lens supported by the case; and

a linear light source for illuminating a document to

be read, the linear light source including an insulating

25

substrate having a first end and a second end opposite thereto,

a plurality of light emitting elements supported on the

substrate and arranged in a row extending from the first end

to the second end, a wiring pattern in electrical connection with the plurality of light emitting elements, the wiring pattern including a first and a second wiring portions extending from the first end to the second end of the substrate,
5 and a first and a second terminals formed on the substrate;

wherein the first wiring portion includes a connecting end located close to the first end of the substrate, the second wiring portion including a connecting end located close to the second end of the substrate, the connecting end of the
10 first wiring portion being connected to the first terminal, the connecting end of the second wiring portion being connected to the second terminal so that the plurality of light emitting elements emit light of substantially equal brightness.

ABSTRACT

A linear light source (A) includes an insulating substrate (1), a plurality of light emitting elements (3) arranged in a row on the substrate (1), a wiring pattern (2) formed on the substrate (1) in electrical connection with the plurality of light emitting elements (3) for dividing the plurality of light emitting elements (3) into a plurality of groups ($B_1 \sim B_n$), and a first and a second terminals (23a, 23b) in conduction with the wiring pattern (2). The plurality of light emitting elements (3) define a plurality of intervals ($P_1 \sim P_{2n-1}$) between adjacent light emitting elements. The plurality of intervals ($P_1 \sim P_{2n-1}$) are set to differ from each other in length.

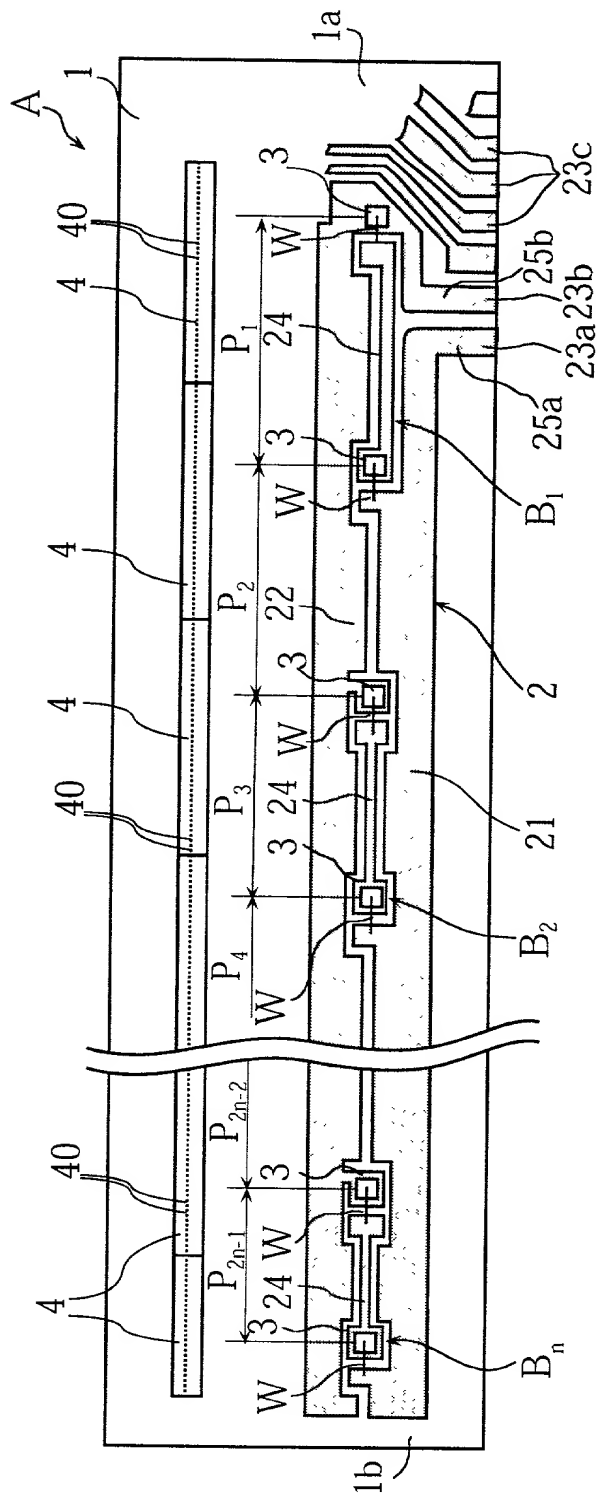
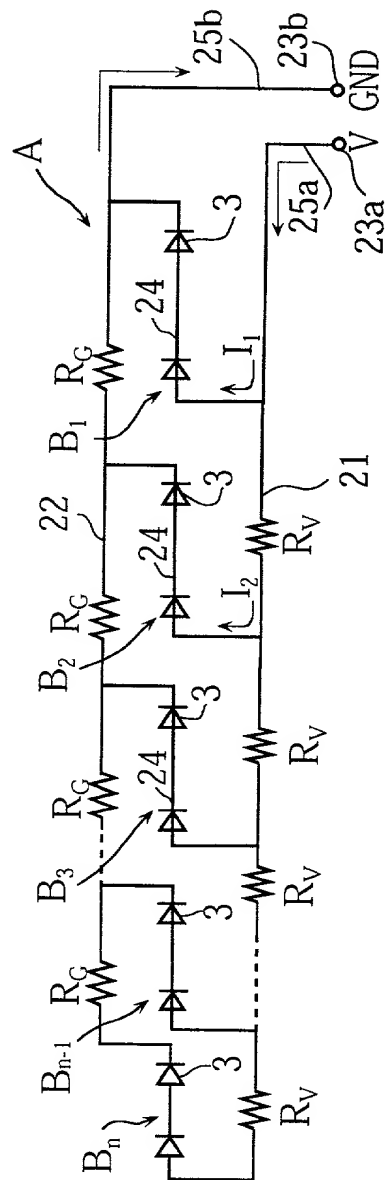


FIG. 1B



REPORT



FIG. 3

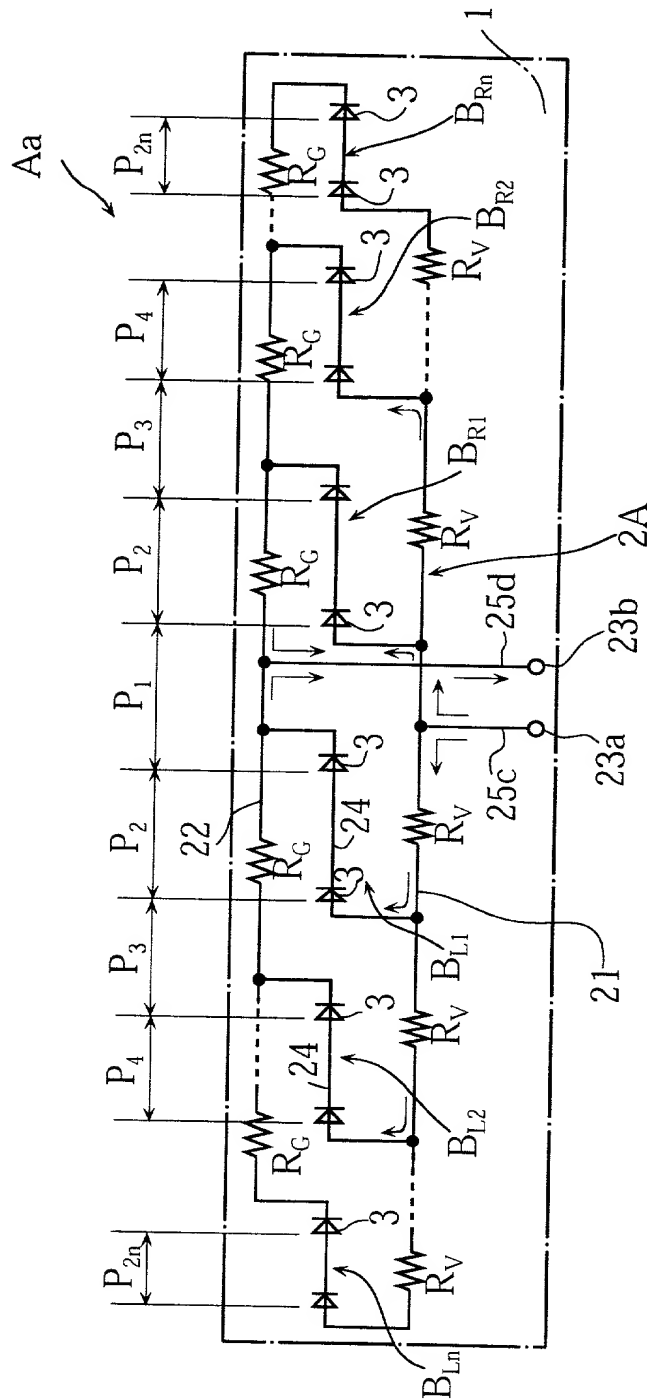


FIG. 5A

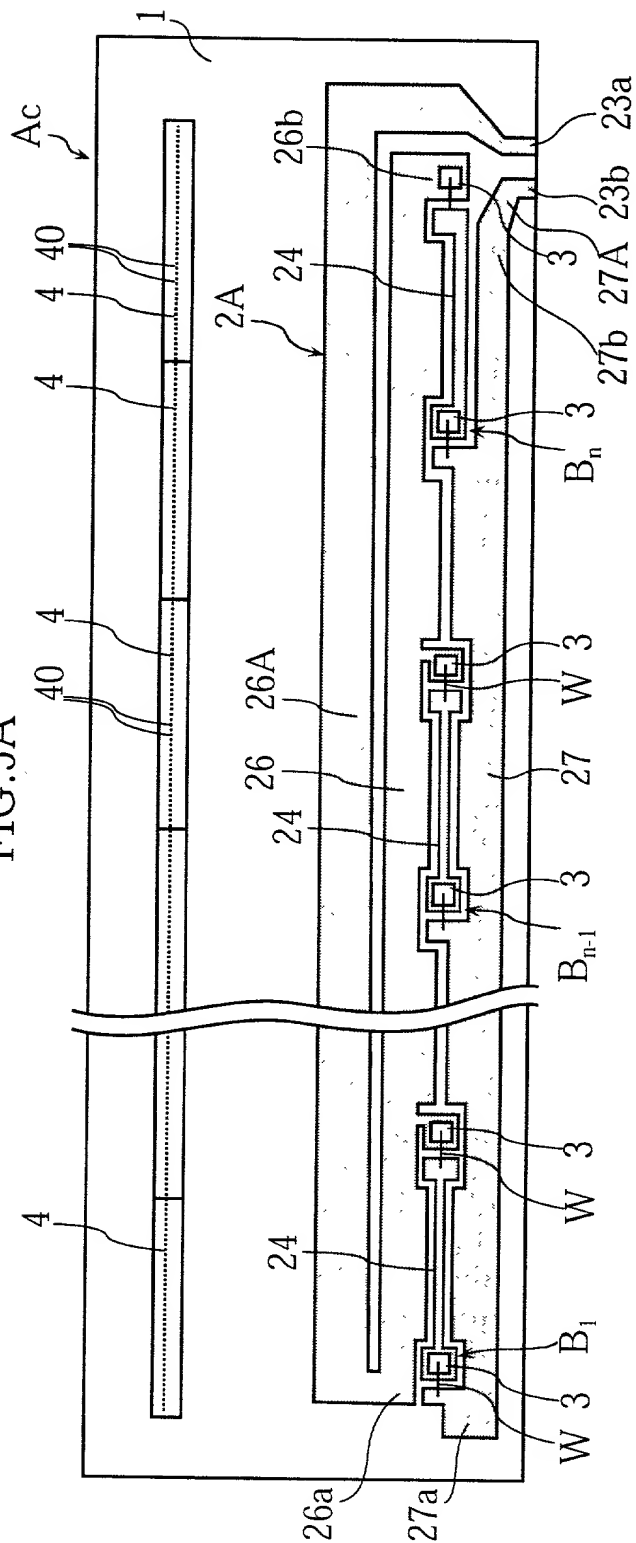


FIG. 5B

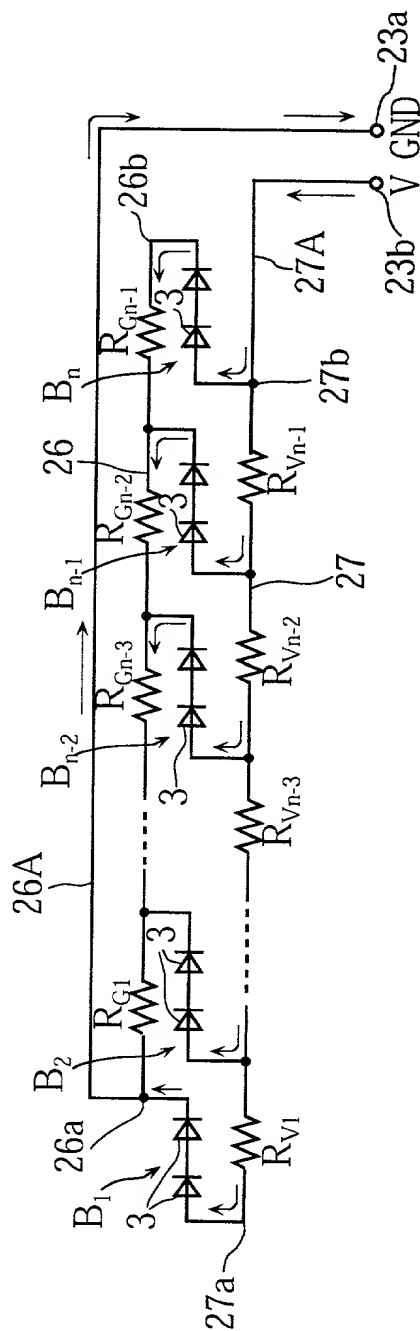


FIG. 6A

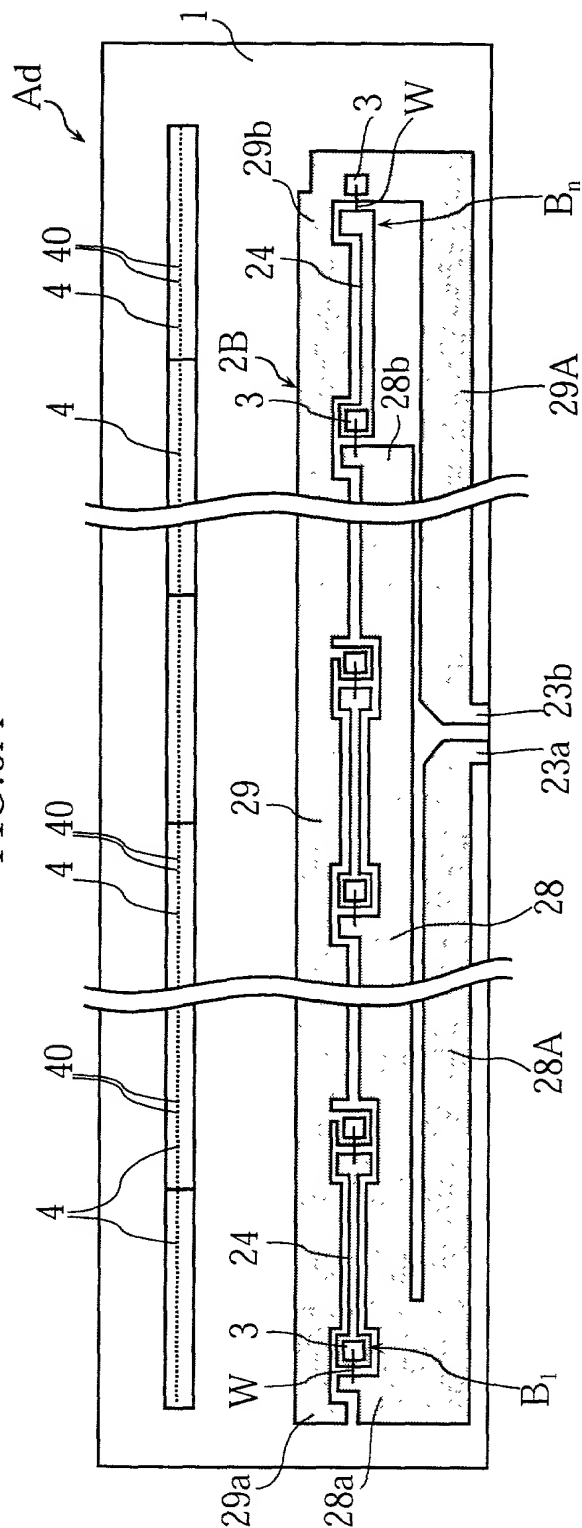


FIG. 6B

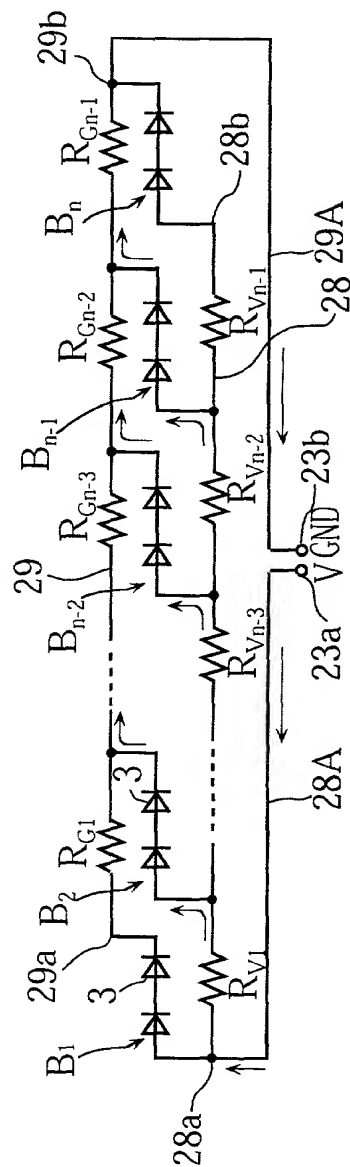


FIG. 7A
PRIOR ART

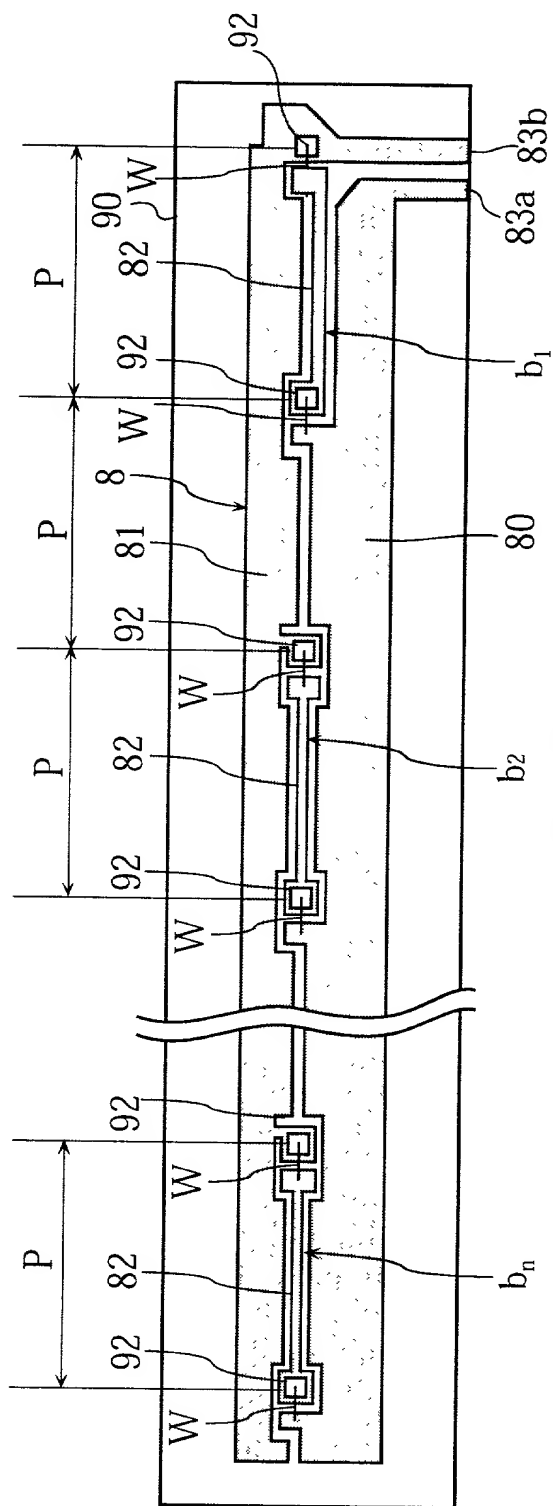
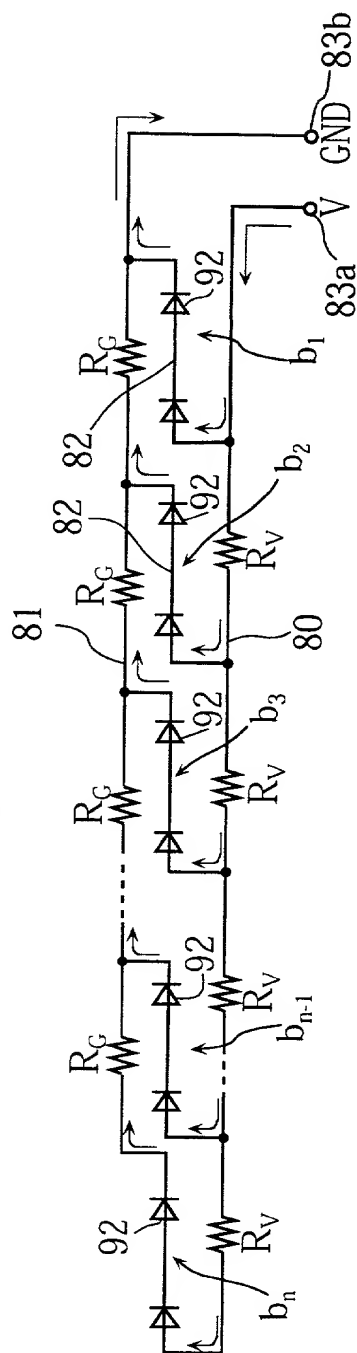


FIG. 7B
PRIOR ART



Declaration and Power of Attorney For Patent Application

特許出願宣言書

Japanese Language Declaration

私は、下欄に氏名を記載した発明者として、以下のとおり宣言する：

As a below named inventor, I hereby declare that:

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおりであり、

My residence, post office address and citizenship are as stated below next to my name,

名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、最初にして唯一の発明者である（一人の氏名のみが下欄に記載されている場合）か、もしくは本来の、最初にして共同の発明者である（複数の氏名が下欄に記載されている場合）と信じ、

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

LINEAR LIGHT SOURCE AND IMAGE

READING APPARATUS INCORPORATING

THE SAME

その明細書を
（該当する方に印を付す）

the specification of which
(check one)

☐ is attached hereto.

☐ここに添付する。

☐ _____ 日に出席番号
第 _____ 号として提出し、
_____ 日に補正した。
（該当する場合）

☐ was filed on _____ as
Application Serial No. _____
and was amended on _____
(if applicable)

☐ _____ 日にPCT国際出願番号
第 _____ 号として提し、
PCT第19条に基づき _____ 日に補正した。
（該当する場合）

☒ was described and claimed in PCT international application
No. _____ PCT/JP99/07381 _____ filed on
December 27, 1999
and as amended under PCT Article 19 or 34 on _____
(if applicable)

私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討し、理解したことを陳述する。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37部第1章第56条（a）項に従い、本願の審査に所要の情報を開示すべき義務を有することを認める。

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

Japanese Language Declaration

私は、合衆国法典第35部第119条 (a) - (d) 項または第365条 (a) - (b) 項にもとづく下記の外国特許出願または発明者証出願または少なくとも1つの合衆国以外の国を指定したPCT国際出願の外国優先権利益を主張し、さらに優先権の主張に係わる基礎出願の出願日前の出願日を有する外国特許出願または発明者証出願またはPCT国際出願を以下に明記する：

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) or § 365(a)-(b) of any foreign application(s) for patent or inventor's certificate, or of any PCT international application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate or PCT international application having a filing date before that of the application on which priority is claimed:

Prior foreign applications

先の外国出願

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)
Patent Application No. 11-16797	Japan	26/1/1999

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)
Patent Application No. 11-16798	Japan	26/1/1999

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)

Priority claimed

優先権の主張

<input checked="" type="checkbox"/>	<input type="checkbox"/>
Yes あり	No なし

<input checked="" type="checkbox"/>	<input type="checkbox"/>
Yes あり	No なし

<input type="checkbox"/>	<input type="checkbox"/>
Yes あり	No なし

<input type="checkbox"/>	<input type="checkbox"/>
Yes あり	No なし

<input type="checkbox"/>	<input type="checkbox"/>
Yes あり	No なし

私は、合衆国法典第35部第120条にもとづく下記の合衆国特許出願の利益または第365条 (c) 項にもとづく合衆国を指定するPCT国際出願の利益を主張し、本願の請求の範囲各項に記載の主題が合衆国法典第35部第112条第1項に規定の態様で先の合衆国出願に開示されていない限度において、先の出願の出願日と本願の国内出願日またはPCT国際出願日の間に公表された連邦規則法典第37部第1章第56条 (a) 項に記載の所要の情報を開示すべき義務を有することを認める：

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (出願番号)	(Filing Date) (出願日)
------------------------------------	------------------------

(現況)	(Status)
(特許済み、係属中、放棄済み)	(patented, pending, abandoned)

(Application Serial No.) (出願番号)	(Filing Date) (出願日)
------------------------------------	------------------------

(現況)	(Status)
(特許済み、係属中、放棄済み)	(patented, pending, abandoned)

Japanese Language Declaration

私は、ここに自己の知識にもとづいて行った陳述がすべて真実であり、自己の有する情報および信ずるところに従って行った陳述が真実であると信じ、さらに故意に虚偽の陳述等を行った場合、合衆国法典第18部第1001条により、罰金もしくは禁固に処せられるか、またはこれらの刑が併科され、またかかる故意による虚偽の陳述が本願ないし本願に対して付与される特許の有効性を損なうことがあることを認識して、以上の陳述を行ったことを宣言する。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

委任状：私は、下記発明者として、以下の代理人をここに選任し、本願の手続を遂行すること並びにこれに関する一切の行為を特許商標庁に対して行うことを委任する。
(代理人氏名および登録番号を明記のこと)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and /or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

Albrecht, John W.	Reg. No. 40,481	Hamre, Curtis B.	Reg. No. 29,165	Qualey, Terry	Reg. No. 25,148
Ali, M. Jeff	Reg. No. 46,359	Harrison, Kevin C.	Reg. No. 46,759	Reich, John C.	Reg. No. 37,703
Anderson, Gregg I.	Reg. No. 28,828	Hertzberg, Brett A.	Reg. No. 42,660	Reiland, Earl D.	Reg. No. 25,767
Batzli, Brian H.	Reg. No. 32,960	Hillson, Randall A.	Reg. No. 31,838	Samuels, Lisa A.	Reg. No. 43,080
Beard, John L.	Reg. No. 27,612	Holzer, Jr., Richard J.	Reg. No. 42,668	Schmaltz, David G.	Reg. No. 39,828
Berns, John M.	Reg. No. 43,496	Johnston, Scott W.	Reg. No. 39,721	Schuman, Mark D.	Reg. No. 31,197
Black, Bruce E.	Reg. No. 41,622	Kadievitch, Natalie D.	Reg. No. 34,196	Schumann, Michael D.	Reg. No. 30,422
Branch, John W.	Reg. No. 41,633	Karjeker, Shaikat	Reg. No. 34,049	Scull, Timothy B.	Reg. No. 42,137
Bremer, Dennis C.	Reg. No. 40,528	Kastelic, Joseph M.	Reg. No. 37,160	Sebald, Gregory A.	Reg. No. 33,280
Bruess, Steven C.	Reg. No. 34,130	Kettelberger, Denise	Reg. No. 33,924	Skoog, Mark T.	Reg. No. 40,178
Byrne, Linda M.	Reg. No. 32,404	Keys, Jeramie J.	Reg. No. 42,724	Spellman, Steven J.	Reg. No. 45,124
Campbell, Keith	Reg. No. P-46,597	Knearl, Homer L.	Reg. No. 21,197	Stoll-DeBell, Kirsten L.	Reg. No. 43,164
Carlson, Alan G.	Reg. No. 25,959	Kowalchuk, Alan W.	Reg. No. 31,535	Summer, John P.	Reg. No. 29,114
Caspers, Philip P.	Reg. No. 33,227	Kowalchuk, Katherine M.	Reg. No. 36,848	Swenson, Erik G.	Reg. No. 45,147
Chiapetta, James R.	Reg. No. 39,634	Lacy, Paul A.	Reg. No. 38,946	Tellekson, David K.	Reg. No. 32,314
Clifford, John A.	Reg. No. 30,247	Larson, James A.	Reg. No. 40,443	Trembath, Jon R.	Reg. No. 38,344
Daignault, Ronald A.	Reg. No. 25,968	Leon, Andrew J.	Reg. No. P-46,869	Tuchman, Ido	Reg. No. 45,924
Daley, Dennis R.	Reg. No. 34,994	Leonard, Christopher J.	Reg. No. 41,940	Underhill, Albert L.	Reg. No. 27,403
Dalglisch, Leslie E.	Reg. No. 40,579	Licpa, Mara E.	Reg. No. 40,066	Vandenburgh, J. Derek	Reg. No. 32,179
Daulton, Julie R.	Reg. No. 36,414	Lindquist, Timothy A.	Reg. No. 40,701	Wahl, John R.	Reg. No. 33,044
DeVries Smith, Kate	Reg. No. 42,157	Lycke, Lawrence E.	Reg. No. 38,540	Weaver, Karrie G.	Reg. No. 43,245
DiPietro, Mark J.	Reg. No. 28,707	McDonald, Daniel W.	Reg. No. 32,044	Welter, Paul A.	Reg. No. 20,890
Edell, Robert T.	Reg. No. 20,187	McIntyre, Jr. William F.	Reg. No. 44,921	Whipps, Brian	Reg. No. 43,261
Epp Ryan, Sandra	Reg. No. 39,667	Mitchem, M. Todd	Reg. No. 40,731	Whitaker, John E.	Reg. No. 33,044
Glance, Robert J.	Reg. No. 40,620	Mueller, Douglas P.	Reg. No. 30,300	Wickhem, J. Scot	Reg. No. 41,376
Goggin, Matthew J.	Reg. No. 44,725	Nichols, A. Shane	Reg. No. 43,836	Williams, Douglas J.	Reg. No. 27,054
Golla, Charles E.	Reg. No. 26,896	Pauly, Daniel M.	Reg. No. 40,123	Withers, James D.	Reg. No. 40,376
Gorman, Alan G.	Reg. No. 38,472	Phillips, Bryan K.	Reg. No. P-46,990	Witt, Jonelle	Reg. No. 41,980
Gould, John D.	Reg. No. 18,223	Phillips, John B.	Reg. No. 37,206	Wu, Tong	Reg. No. 43,361
Gregson, Richard	Reg. No. 41,804	Plunkett, Theodore	Reg. No. 37,209	Xu, Min S.	Reg. No. 39,536
Gresens, John J.	Reg. No. 33,112	Prendergast, Paul	Reg. No. 46,068	Zeuli, Anthony R.	Reg. No. 45,255
Hamer, Samuel A.	Reg. No. P-46,754	Pytel, Melissa J.	Reg. No. 37,209		

書類の送付先：

Douglas P. Mueller
MERCHANT & GOULD P.C.
3200 IDS Center, 80 South 8th Street,
Minneapolis, MN 55402-2215, U.S.A.

Send Correspondence to:

Douglas P. Mueller
MERCHANT & GOULD P.C.
3200 IDS Center, 80 South 8th Street,
Minneapolis, MN 55402-2215, U.S.A.

直通電話連絡先：(電話番号)

Douglas P. Mueller at 612/371-5237

Direct Telephone Calls to: (telephone number)

Douglas P. Mueller at 612/371-5237

Japanese Language Declaration

唯一のまたは第一の発明者の氏名	Full name of sole or first inventor
1-W	Hisayoshi Fujimoto
同発明者の署名	Inventor's signature
日付	Date
	Hisayoshi Fujimoto June 25, 2001
住所	Residence
	c/o ROHM CO., LTD. Kyoto, Japan JP Y
国籍	Citizenship
	Japan
郵便の宛先	Post Office Address
	c/o ROHM CO., LTD. 21, Saiin Mizosaki-cho, Ukyo-ku, Kyoto-shi, Kyoto 615-8585 Japan

第2の共同発明者の氏名 (該当する場合)	Full name of second joint inventor, if any
2-W	Hiroaki Onishi
同第2発明者の署名	Second Inventor's signature
日付	Date
	Hiroaki Onishi June 25, 2001
住所	Residence
	c/o ROHM CO., LTD. Kyoto, Japan JP Y
国籍	Citizenship
	Japan
郵便の宛先	Post Office Address
	c/o ROHM CO., LTD. 21, Saiin Mizosaki-cho, Ukyo-ku, Kyoto-shi, Kyoto 615-8585 Japan

第3の共同発明者の氏名 (該当する場合)	Full name of third joint inventor, if any
3-W	Norihiro Imamura
同第3発明者の署名	Third Inventor's signature
日付	Date
	Norihiro Imamura June 25, 2001
住所	Residence
	c/o ROHM CO., LTD. Kyoto, Japan JP Y
国籍	Citizenship
	Japan
郵便の宛先	Post Office Address
	c/o ROHM CO., LTD. 21, Saiin Mizosaki-cho, Ukyo-ku, Kyoto-shi, Kyoto 615-8585 Japan

第4の共同発明者の氏名 (該当する場合)	Full name of fourth joint inventor, if any
同第4発明者の署名	Fourth Inventor's signature
日付	Date
住所	Residence
国籍	Citizenship
郵便の宛先	Post Office Address

第5の共同発明者の氏名 (該当する場合)	Full name of fifth joint inventor, if any
同第5発明者の署名	Fifth Inventor's signature
日付	Date
住所	Residence
国籍	Citizenship
郵便の宛先	Post Office Address